

# Development Of First High School Mathematics LKPD Based On Case Method Integrated Local Culture Mandailing Tribe

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## **Abstract.**

*Learning is a process of interaction between students and teachers, with lesson materials, delivery methods, learning strategies and learning resources in a learning environment. The success of learning can be seen through the level of success in achieving educational goals. Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state, and have global mindset. The implementation of learning with the case method model is carried out to overcome the problems that arise as a result of the Limited Face-to-face Learning (PTMT) policy, such as less active student learning activities, low student learning responses and low student learning outcomes. Junior high school students belonging to the Generation Z category have an attitude of openness, this generation accepts various views and mindsets, causing them to easily accept diversity and differences in views. As a result, Gen Z becomes difficult to define themselves, self-identity changes based on the factors that influence their thinking. Therefore, it is very important to restore national identity or introduce the cultural identity of the surrounding community so as not to be eroded by the development of the outside world which makes generation Z forget local culture, one of which is the Mandailing Tribe Culture in North Sumatra. The development research uses the ADDIE Model by integrating the Local Culture of the Mandailing Tribe in North Sumatra in developing the Mathematics LKPD for Grade VII Junior High Schools based on students' initial perceptions of the current condition of Generation Z. The use of the Case Method approach aims to improve students' critical thinking skills based on the cases presented in the teaching materials.*

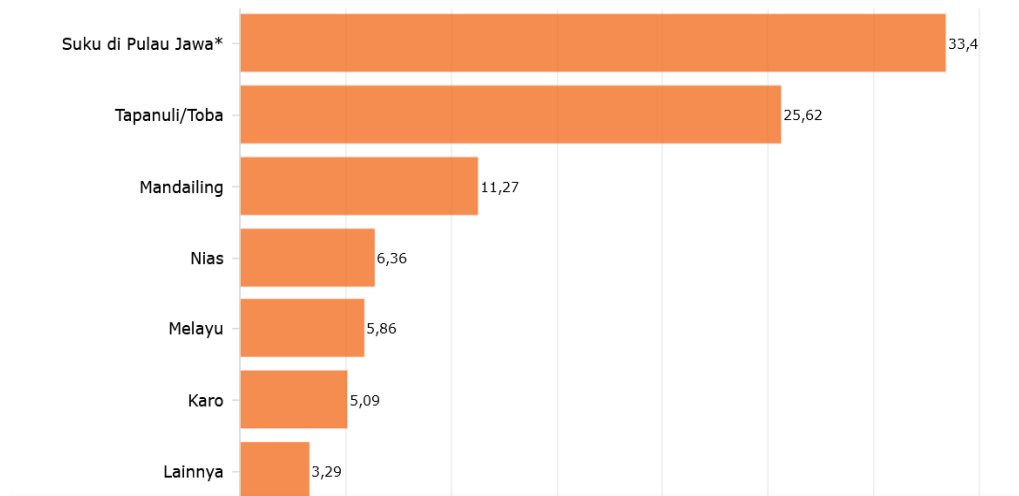
**Keywords:** *Validity, Student Performance Sheet (LKPD), Case Method, Mandailing Tribe Culture.*

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## **I. INTRODUCTION**

Education is an effective means of supporting the development and improvement of human resources in a more positive direction. The progress of a nation depends on quality human resources, where it is largely determined by the existence of education. As has been written in Law Number 20 of 2003 concerning the National Education System (Muhdi, Nurkolis, & Yuliejantiningih, 2020), one of which discusses education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character and skills needed by himself, society, nation and state (Noor, 2018). Learning mathematics for students is the formation of a mindset in understanding an understanding as well as in reasoning a relationship between those meanings (Sulistyo & Junaedi, 2021). In learning mathematics, students are accustomed to gain understanding through experience about the properties that are owned and not owned by a set of objects (abstraction). One way to implement mathematics learning is to use the case method learning model. The case method learning model is a learning model that presents narrated content accompanied by questions and activities that encourage students to conduct group discussions and solve complex problems (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020). In using the case method learning model students are required to solve the cases given in groups in a real-life context, analyze the cases given and find solutions to the cases given (Coman, Țîru, Meseșan-Schmitz, Stanciu, & Bularca, 2020). Based on this, the use of the case method learning model is useful to provide opportunities for students to hone their critical thinking skills (Hasibuan & Prastowo, 2019).

The initial subject to find out how students perceive LKPD based on Case Method which is integrated with the local Mandailing culture is junior high and high school age or commonly referred to as Generation Z (Gen Z) in several schools in North Sumatra. Gen Z is a generation that has never known a world that is completely isolated from the existence of other people. Social media negates that one cannot talk to anyone, anywhere and anytime. Social media is a bridge over alienation, because everyone can connect, communicate, and interact (Bai & Gao, 2021). This relates to the second characteristic, that Gen Z's connectedness with other people is paramount. Third, skills gaps are possible in this generation. This is why efforts to transfer skills from previous generations such as interpersonal communication, work culture, technical skills and critical thinking must be intensively carried out. Fourth, the ease with which Gen Z explores and connects with many people in various places virtually through an internet connection, causes their experience of browsing geographically to be limited. Even so, their ease of connecting with many people from various parts of the world causes Gen Z to have a global mindset (global mindset) (Hasudungan & Kurniawan, 2018).



**Fig 1.**Percentage of North Sumatran Population by Ethnicity

Source: *Badan Pusat Statistik* (BPS/Central Bureau of Statistics) (Jayani, 2021)

**Table 1.**Number of Population by Gender and Regency/City (Soul) in North Sumatra Province

Regency/ City	Total Population by Gender and Regency/City (Soul)		
	total	Woman	Man
	2020	2020	2020
North Sumatra	14703532	7367650	7335882
Nias	143983	73975	70008
Mandailing Natal	451028	229627	221401
South Tapanuli	283389	142591	140798
Middle Tapanuli	382917	190723	192194
North Tapanuli	303688	153675	150013
Toba Samosir	184493	92769	91724
Labuhan Batu	501596	248200	253396
Asahan	735026	365894	369132
Simalungun	871678	437502	434176
Dairi	285481	142968	142513
Karo	421997	212608	209389
Deli Serdang	2234320	1110229	1124091
Langkat	1048100	520522	527578

South Nias	322520	162444	160076
Humbang Hasundutan	191776	96596	95180
Pakpak Bharat	49688	24593	25095
Samosir	126710	63782	62928
Serdang Bedagai	617772	307765	310007
Batu Bara	420103	208695	211408
North Padang Lawas	277423	138093	139330
Padang Lawas	286627	143014	143613
South Labuhanbatu	344819	169022	175797
North Labuhanbatu	366603	181523	185080
North Nias	138800	70084	68716
West Nias	82425	42919	39506
Sibolga	87791	43668	44123
Tanjungbalai	177005	87797	89208
Pematangsiantar	257110	131680	125430
Tebing Tinggi	166100	83994	82106
Medan	2295003	1162124	1132879
Binjai	279302	140018	139284
Padangsidempuan	224483	115097	109386
Gunungsitoli	143776	73459	70317

Source: (Badan Pusat Statistik Provinsi Sumatera Utara, 2020)

Based on the results of previous research on developing an e-module based on integrated project-based learning, Ki Hajar Dewantara argues that Independent Learning is the freedom given to students to find all knowledge on their own by using their minds (Pendi, 2020; Abidah, Hidayatullaah, Simamora, Fehabutar, & Mutakinati, 2020). Project-based learning will accommodate students' independence because it will result in higher student engagement and deep concept understanding. The development of SMP Mathematics E-modules in the form of the latest project-based interactive learning e-modules integrated with *Merdeka Learning* is very necessary because interactive e-modules can help today's students to be actively involved in learning (Prodjo, 2019). Some of the features available in the Junior High School Mathematics E-book include instructions for using e-modules, concept map features, being able to embed youtube links, google form links, teacher audio/voice features to explain the learning objectives of each book chapter, teacher presentation videos, student assignment link, and student evaluation link. All of these features make the e-book interesting and interactive. The purpose of this study was to obtain an integrated project-based learning-based E-Module of Junior High School Mathematics which was feasible from the aspect of validity and practicality. The results showed that the validity aspect obtained from the assessment of material and media validators was 3.67 with a very decent category. Based on the practical aspect, the responses of students and mathematics teachers were 3.50 (87.5%) and 3.64 (91%) in the very practical category, respectively. For the student project sheet developed to stimulate 6 aspects of student learning independence based on the learning independence instrument (Hidayati & Listyani, 2010) as many as 19 items. The given project sheet is able to stimulate students to achieve learning independence scores in the medium category (mean 3.27 on a scale of 5).

The conclusion is that the interactive e-module and the Independent Learning Integrated Student Project Sheet are stated to be very feasible and very practical to use in the mathematics learning process for seventh grade junior high school students. Students who are Gen Z are very interested if the learning given is based on cases that occur around them by providing varied projects that researchers provide so that students will have the feeling of being free to choose projects that are close to field cases that occur around them. Based on the Decree of the Minister of Education and Culture No.754/P/2020, it is written as the Main

Performance Indicator (IKU) no.7, namely "Learning in class is the percentage of S1 and D4/D3/D2 courses that use case-solving learning methods (case method) or project-based group learning (team-based project) as part of the weight of the evaluation. The steps of the case method are finding learning/lecture problems (instructional problems), knowing student characteristics (learner characteristics), analyzing tasks (task analysis), making learning objectives/ lectures, make sequences of learning/lecture content, determine learning strategies, fulfill learning equipment, make learning assessment standards, and equip them with the latest learning resources and media. The hope is that students will not only gain knowledge, but also individual and group skills. In line with McLean (2016) writing that case-based textbooks are learning resources from a course that has the characteristics of case-based learning. Therefore, the preparation of textbooks must be adapted to case-based learning (Srinivasan, Wilkes, Stevenson, Nguyen, & Slavin, 2007).

According to Williams in Hasudungan (2021) the order in presenting the contents of case-based textbooks is;

- 1) determine the case,
- 2) analyze the case by discussing in groups,
- 3) determine the information, data and literature,
- 4) determine the steps for solving the given case,
- 5) formulate the conclusions of the case,
- 6) present the conclusions generated in group discussions,
- 7) Agree on a conclusion on the given case.

According to Handoko (in Angela, Tjun Tjun, Indrawan, & Krismawan, 2018)

A Case deserves to be called a case in case-based learning, if it has the following characteristics:

- 1) Decision-oriented: the case describes real conditions that demand immediate resolution of the case;
- 2) Participation: cases are described to increase the motivation of students' involvement in analyzing problems;
- 3) Development of discussion: case content is presented so that various thoughts and analysis of the results of discussions between students are formed;
- 4) Substantive: the main part of the case discusses rumors and real information; and
- 5) Questions: cases usually don't ask questions, because understanding what should be asked is an important part of case analysis.

Based on the results of Torrance (2007) research, it was found that the differences in learning outcome categories were caused by differences in the instructional approach and assessment process used. Thus, an instructional approach and assessment process are very important to obtain the expected learning outcomes. The problems that have been described previously may also be caused by the instructional approach that is not able to create student competence in analyzing and solving problems (Nababan, Sumantri, Tanjung, & Hasudungan, 2022). The instructional method that emphasizes intellectual skills includes concepts, rules, and procedures for solving problems (Johnson, 1997; Albay, 2019). Therefore, the concept of education is not reduced to a test that only measures knowledge transfer, but is broader, covering the formation of skills and basic attitudes, such as criticality, creativity and openness to innovation and inventions. All of that is very necessary so that students are able to survive and answer the ever-evolving challenges. In this case, educators are required not only as a transfer of knowledge, but more than that, they also act as agents of enlightenment. In April 2003, the Directorate General of Higher Education gave a mandate, one of which was the application of the principle of Student-Centered Learning (SCL) in the learning process (Ratnasari, Kurniawati, & Syukur, 2020). SCL can be applied effectively when lecturers integrate learning methods and teaching materials used to invite students to play an active role in learning to find concepts, principles, procedures and solve problems/cases based on concepts and principles that have been understood. The main reasons for the development of case-based teaching materials are (1) that teaching materials require illustrations of real cases in the application of science; (2) the available teaching materials are still theory-based, and (3) build strong reasons for students to learn to understand, solve problems, apply mathematical concepts in everyday life.

## II. METHODS

ADDIE development model is an acronym for analysis, design, development, implementation, and evaluation. And the overall procedure for developing this research can be seen as follows:

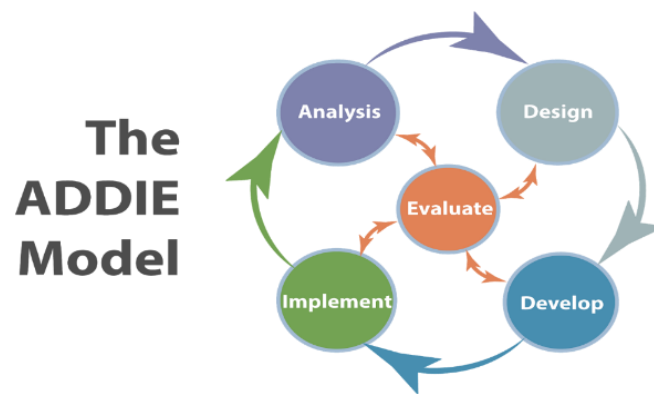


Fig 2. ADDIE Model Development Stage (Yeh & Tseng, 2019)

### Success Indicator

Product of Teaching Materials and LKPD Based on Case Method Integrated local culture of the Mandailing Tribe Developed. The development of teaching materials in this study is said to be successful if the teaching materials developed meet the criteria of validity, practicality, and effectiveness and see an increase in student learning outcomes. The following is an explanation of the criteria:

1. The validity of the developed teaching material products is in the fairly valid category (70.01% - 85 %) or very valid (85.01% - 100%)
2. The product of teaching materials is said to be practical if the results of the questionnaire responses of teachers and students are in the practical category (70.01% - 85.00%) or very practical (85.01% - 100.00%) and learning is carried out.
3. Teaching Material Products are said to be effective if they meet the students' learning mastery achievement classically, that is, there are students who take the posttest and get a minimum score of 75.

## III. RESULT AND DISCUSSION

### Learning Model Case Method

The learning model is a framework in the presentation of teaching materials which includes all aspects before or after learning is carried out as well as all facilities used directly or indirectly in the learning process. The case method learning model presents narrated content accompanied by questions and activities that encourage students to conduct group discussions and solve complex problems. The case method is a learning model that requires students to analyze the problems given in the form of cases, make conclusions based on available information to draw conclusions from the assumptions formulated (Safitri & Purbaningrum, 2020). Case-based learning (case method) is learning that focuses on contemporary phenomena in real life. This learning aims so that students can have experience in making the right decisions in carrying out problem solving processes using information that is in real life (Novriani, Johari, & Hariyadi, 2017). From some of the explanations above, the case method learning model is a case-based learning model in the form of a narrative about contemporary phenomena that requires students to conduct group discussions on the given problem.

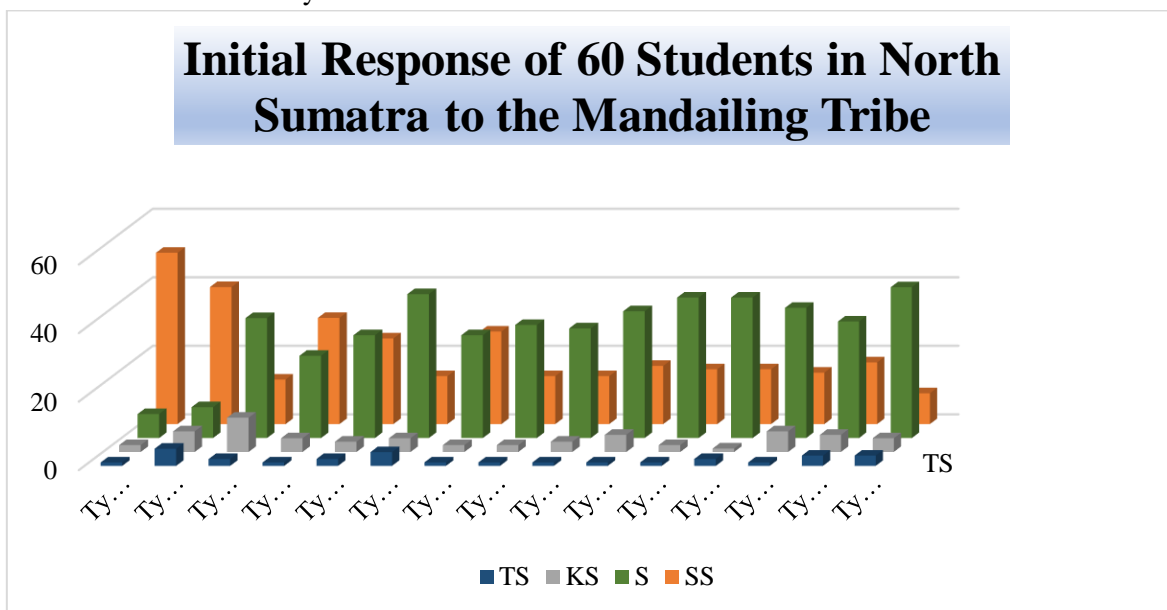
### Case Method Pembelajaran Learning Model Syntax

Syntax is a phase, stages or steps that clearly indicate the activities carried out by teachers and students in the learning process. According to Nopitasari, Indrowati, & Santosa (2012) the steps in the Student Case model are as follows: (1) the teacher divides the class into pairs or groups, (2) the teacher divides the problems, (3) the group discusses, (4) each group makes a problem and then conveys the results of the discussion to other participants, (5) the teacher guides in learning by providing conclusions, reflections, and evaluations. Meanwhile, according to Williams (2004: 4) the steps of the case method learning model are as follows: 1) Define the case. The case is selected according to the material and learning objectives that

will be carried out by students. 2) Analyze cases. At this stage students conduct group discussions where students must formulate problems by optimizing their initial knowledge. 3) Find information, data and literature independently. Students find evidence or supporting data to solve a given problem or case. 4) Determine the solution. Students determine the steps to solve the problem or case given. 5) Make conclusions. Students make conclusions on the answers they discuss in groups. At this stage students are required to be able to think logically or rationally in order to get the right conclusions. 6) Presenting the results. The group presents the results that have been mutually agreed upon. 7) Make repairs. Students make improvements to the answers that are less precise.

**1. Survey Results based on Student Perceptions in North Sumatra**

In the initial survey conducted by researchers on several schools both at the junior and senior high school levels in North Sumatra. By using a Likert scale, namely Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4). There are 5 questions about students' knowledge of Mandailing Tribe Culture, 5 questions about the educational value of the benefits of LKPD based on local Mandailing Tribe culture, and 5 questions about the Importance of Linking Mandailing culture to Mathematics. With a total of 15 questions. The results of the initial survey can be seen in the table below.



**Fig 3.** Student Perceptions in North Sumatra

Based on figure 2 above, it was found that the number of students who disagreed was 3.3%, students who did not agree were 6.7%, students who agreed were 53.3% and students who strongly agreed were 36.67 %. The initial conclusion was obtained by the researcher according to the Type 1 question that students' perceptions of the Local Culture of the Mandailing Tribe were that students knew that the Mandailing Tribe was an Indigenous Tribe originating from North Sumatra. The culture of the Mandailing tribe is very rarely encountered by students in the community. And students cannot mention some of the Mandailing tribal cultures that are still preserved to this day. Students strongly agree that the culture of the Mandailing tribe is very important to be preserved because there are many valuable lessons contained therein. And one of the cultures that is developing in North Sumatra today is the culture of the Mandailing tribe. For the Type 2 question regarding educational values related to the Local Culture of the Mandailing Tribe, students realize the importance of understanding the Mandailing tribe because in it there are many lessons and life lessons which if applied in everyday life can shape the character of students in accordance with national education goals. Likewise for Problem Type 3, the average student strongly agrees that incorporating the local culture of the Mandailing Tribe into teaching materials and student worksheets will help them know and understand the culture. In accordance with the data obtained, the researcher feels it is very necessary to provide a solution to the current condition of Generation Z which is starting to forget cultural values. Especially the local culture of the Mandailing Tribe in North Sumatra.

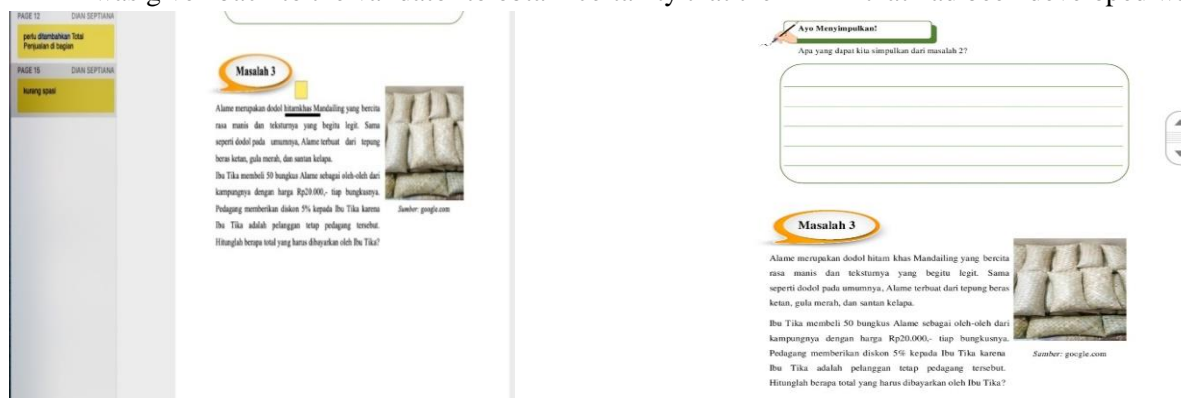


The current condition is also related to the results of Mustakim's research (2020: 9) which states that learning is currently being carried out that requires online learning. Students rated online mathematics learning as very effective (23.3%), some rated it as effective (46.7%), and rated it average (20%). Although there are also students who think online mathematics learning is not effective (10%). Most students think that online learning provides a new experience that is more challenging for them than conventional (face-to-face) learning. In accordance with the results of Asmuni's research (2020: 283) Online learning is an inevitable choice for educational institutions. In the midst of the Covid-19 pandemic, this learning model can be a solution so that the teaching and learning process can continue (Pronika, 2022). At the end of 2021 and early 2022 the Limited Face-to-face Learning (PTMT) policy is one of the government policies in the era of recovery from the COVID-19 virus outbreak (Syah, 2020). The concept of Limited Face-to-face Learning (PTMT) is to regulate the number of students studying at school to be less than usual, so that students who are not scheduled to study at school must carry out online learning. The Limited Face-to-face Learning Policy (PTMT) is a new thing in the world of Indonesian education (Hasudungan, Ofianto, & Ningsih, 2022). Based on observations made by researchers in several schools in North Sumatra. The implementation of this policy began at the beginning of the Odd Semester of the 2021/2022 Academic Year and continues until now. Limited Face-to-face Learning (PTMT) which is carried out with a system of students divided into 2 (two) waves per class attending school with a schedule of carrying out learning at school for 3 days a week and doing learning at school for 3 hours (Saefulmilah & Saway, 2020).

Based on interviews with mathematics teachers at SMP Al Hijrah 2 Deli Serdang, it was found that student learning outcomes were also unsatisfactory. Difficulties in understanding students make the teacher think deeply to invite students to analyze cases related to mathematics. Cases need to be presented in teaching materials or student worksheets to make it easier for students to understand the material. So that student learning outcomes will be satisfactory.

**Lembar Kerja Peserta Didik (LKPD/Student Worksheet) Validation Results**

The Student Activity Sheet is designed based on the Case Method integrated with the Local Culture of the Mandailing Tribe. Then Validation of Material Experts, Cultural Experts, and Teacher Responses as LKPD users that have been designed and developed. LKPD was developed based on the ADDIE research and development method. The validator is divided into 3 parts, namely the LKPD Material Expert Validation which is validated by two lecturers. Validation of SMP teachers as LKPD users and validators of Mandailing Tribe cultural experts There were several inputs from the validator before it was finally revised and the LKPD was given back to the validator to obtain certainty that the LKPD that had been developed was valid.



**Fig 4.** Display before Validation, and Display after validation



**Fig 5.**Cover Display before Validation, and Cover Display after Validation Field Trial Results

Field trials were conducted at SMPN 17 Medan in class VIII-3 with a total of 30 students. The problem in this study is that students' critical thinking skills are still low, as seen in the results of the initial ability test given by the researcher to the VIII-3 class students. From the results of the initial tests that have been analyzed, the results are shown in table 1.

**Table 2.**Description of Initial Ability Indicators

Question	Analysis Indicator	Synthesis Indicator	Indicator Summing up
1.	80%	38,33%	35%
2.	58,33%	28,33%	11,67%

The average value of students' critical thinking skills on the initial ability test was 39.58 in the absence of students who were able to think critically (value 70). So that the value has not reached classical completeness (value 70) has not reached 85% of the total number of students. The relationship between achievements and indicators based on the table above can be seen for analysis indicators. The description of the distribution of students' initial critical thinking abilities found that in the moderately critical category about 5 people (16.7%) and in the non-critical category as many as 25 people (83.3%). From these data it is known that students' critical thinking skills are still low. Based on the results of student answers on the initial ability test, the problems found were almost the same as the problems that the researchers found were almost the same as the problems found during the initial observation.

#### Critical Thinking Ability Test Data Analysis

The results of the students' critical thinking ability test answers seen from each indicator on critical thinking skills can be described as follows:

1. The ability to analyze questions is seen from the students' ability to understand by presenting information from the questions, there are 11 students or 36.67% in the very critical category, 14 students or 36.67% in the critical category, and 5 students or 16.67% in the non-critical category. The average score of students' ability to analyze questions is 85.33, which means that students are in the critical category in analyzing questions.
2. Ability to Synthesize Problems seen from the ability of students to combine the information obtained and make mathematical models and perform calculations to determine the solution to a problem according to the analysis of the problem there are 12 students or 40% in the very critical category, 9 students or 30% in the critical category, 5 students or 16.67% in the moderately critical category, and 4 students or 13.33% in the non-critical category. The average score of students' ability to synthesize questions is 83.88, meaning that students are in the critical category in synthesizing questions.
3. Conclusion Ability is seen from the students' ability to conclude the solutions obtained, there are 12 students or 40% in the very critical category, 7 students or 23.33% in the critical category, and 11 students or 36.67% in the non-critical category. The average score of students' ability to conclude is 79.99, meaning that students are in the critical category in giving conclusions.



#### IV. CONCLUSION

Based on the validation results from material experts, media experts and cultural experts, LKPD SMP based on Case Method integrated Local Culture of the Mandailing Tribe was declared valid (> 85%). After the LKPD was tested in the experimental class, it was found that the students' critical thinking ability increased and reached the level of complete learning with an average value of > 75.

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